COURSE SYLLABUS
ECE 713 Elements of Radio Wave Propagation
Spring Quarter 2008
MWF 9:30-10:18, Smith Labs 1048

Instructor:	Prof. Joel Johnson
Office:	Dreese Lab 452 or ESL 221 Phone: 292-1606 or 1593, email: johnson@ece.osu.edu
Office Hours:	MWF 10:30-11, 2:30-3, Dreese 452, or by appointment
Text:	Course notes, “The propagation of electromagnetic signals,” available at Cop-EZ, Tuttle Garage
References:	Rohan, Introduction to Electromagnetic Wave Propagation, Artech House, 1991
	Bothias, Radio Wave Propagation, North Oxford, 1987.
	Davies, “Ionospheric Radio Propagation,” NBS Monograph 80, 1966.
Course web page:	http://www.ece.osu.edu/~johnson/713/ece713.html

Subject Matter:

In ECE 713 we will study the basic physical mechanisms of electromagnetic wave propagation in the troposphere and ionosphere. Our goal will be to obtain an understanding of which mechanisms are important in a given situation, and to be able to apply simple theoretical and empirical models of these phenomena to the design and analysis of communications and radar systems. Given the complexity of most propagation environments, purely theoretical models for propagation predictions often have limited accuracy, and empirical information is important in most cases. However, since our goal is to obtain a physical understanding of propagation phenomenology, we will focus on the basic physics while realizing that in practical situations empirical models will be necessary for improvements. Sources of empirical information will be indicated throughout the course.

Prerequisites:

The official prerequisite is ECE 312 or an equivalent undergraduate electrodynamics course. It is recommended that you carefully study the review materials in the first two weeks of the course to ensure that you are prepared for the remaining subjects. All students should be familiar with basic electromagnetic theory and should be comfortable with basic antenna, plane wave, and reflection problems (although most of this material will be reviewed when needed). Reviewing MATLAB programming skills will also be useful for completing the course homeworks.

Grading:

Grades for the course will be based upon an in-class midterm examination, a final exam, and five in-class quizzes. Weights are assigned as follows:

Midterm	40%
Final exam	40%
Quizzes	20%

Refer to the attached schedule and calendar for exam and quiz dates. Make-up examinations will be given only in emergencies, no make-up quizzes will be given. All exams and quizzes will be open book and open notes.

Homework:

There are six problem sets and solutions on the course webpage. These homeworks will not be graded in detail, but are intended to help students practice the course material, as well as to cover some subjects not discussed in lecture. Students who turn in their own solution of the homework on the date of a homework quiz (including generation of any figures, web searches, etc.) will receive a bonus of 20% on their quiz grade, up to a maximum quiz grade of 100.

Quizzes:

Quizzes will occupy the final 10-15 minutes of class on their assigned dates, and will be comprised of a set of multiple choice questions. These questions will cover recent lecture material as well as problems and information from the homework assignments and their solutions. The lowest grade of the 5 quizzes will be dropped when computing the final quiz grade average.

Other:

Please feel free to let me know your opinions on course content, pace, and difficulty. Questions in class are also encouraged, as they give everyone a chance to learn. The course notes for this course are currently being revised, so please let me know of any errors or suggestions you have for improving them.

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Mon	Wed	Fri
March 24 **PS1 assigned** Propagation mechanisms Chapter 1	26 Dielectric properties Chapter 2	28 Dielectrics, Plane waves Chapter 2, 3 pp. 55-64
31 Plane waves Chapter 3	April 2 Basic antenna properties Chapter 4, pp. 81-95	4 **PS1 Quiz** System and external noise Chapter 4, pp 95-109
7 **PS2 assigned** Direct transmission, atmospheric absorption Chapter 5	9 Rain and other impairments Chapter 5	11 Theories of rain attenuation, diversity improvements Chapter 5
14 Reflection from a dielectric Chapter 6, pp. 113-128	16 **PS2 Quiz** Critical angle, refraction Chapter 6, pp. 129-134	18 **PS3 assigned** More on refraction Chapter 6, pp. 134-144
21 Ducting, ray tracing Chapter 6, pp. 144-154	23 Path profiles Chapter 7, pp. 155-163	25 **PS4 assigned** **Midterm Exam**
28 Fresnel zones, diffraction Chapter 7, pp. 164-174	30 Path analysis Finish Chapter 7	May 2 **PS4 Quiz** Empirical path loss models Chapter 8N
5 **PS5 assigned** Random variables and distributions, Chapter 8N	7 Fading distributions Chapter 8N	9 Groundwave propagation Chapter 9N
12 Groundwave, spherical Earth Chapter 9N	14 Ionospheric basics and layers Chapter 10	16 **PS5 Quiz** Propagation in an ionized medium, Chapter 11
19 **PS6 assigned** Propagation in a magnetized plasma, Chapter 11	21 Vertical and oblique paths Chapter 11	23 Oblique ionospheric paths Chapter 11
26 Memorial day (no class)	28 Ionospheric propagation predictions, Chapter 11	30 **PS6 Quiz** Review
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